Atari®

AdSpeedST

Advanced 68000 Accelerator for Atari S Computers

ICD Incorporated
1220 Rock Street
Rockford, IL 61101
USA

(815) 968-2228 Phone
(815) 968-6888 Fax

ICD Europe GmbH
Am Goldberg 9
6056 Heusenstamm
Germany

(0 61 04) 64 03 Telefon
(0 61 04) 67 58 1 Fax

50-90

Owners Manual

For further information or technical support contact ICD, Inc. at 815-968-2228 or via modem at 815-968-2229 (BBS); 76004,1600 (CompuServe); or ICDINC (GEnie).

Note — throughout this manual the following notices apply:

Published by ICD, Inc.
1220 Rock Street
Rockford, IL 61101-1437
U.S.A.

Table of Contents

Introduction

AdSpeed ST is a 68000 accclerator for all Atari ST computers. It runs at 16 megahertz (MHz), twice as fast as the 8 MHz a standard ST uses. It won't double the speed of everything your computer does, for reasons described below, but it will produce a noticeable improvement in performance for almost all of your programs.

Because of the nature of the ST's operation, some programs will show much more improvement than others.

How It Works

Many of the operations of the ST are limited to 8 MHz due to the computer's design. Simply doubling the clock speed, running the whole computer at 16 MHz, won't work. Access to the system's random access memory (RAM) is regulated by the memory management unit (MMU). The Shifter that produces video images and the Direct Memory Access (DMA) chip that handles floppy and hard disk drives also access the RAM through the MMU. This MMU/RAM/Video/DMA subsystem operates on an 8 MHz bus cycle and cannot be accessed at a higher rate without a complete redesign of the computer.

Even with the 68000 running at 16 MHz, it must emulate an 8 MHz bus cycle when accessing the RAM to remain compatible with the rest of the system. With nothing other than a high speed 68000, little performance increase would be realized.

AdSpeed ST uses a high speed static RAM cache and cache tags to gain its speed increases. When an address is needed by the CPU, first the cache tags are checked to see if that information is already in the cache. If it is not, then the data is read normally from the computer's RAM, and no speed increase is realized. It is also stored in the cache. If the information is already in the cache, then the CPU can use it without having to access the computer's RAM. This allows for a full 16 MHz bus cycle. Information is kept in the cache until the space is needed for newer information or a DMA operation occurs.

This RAM cache is most effective with loops in programs, since the whole loop can be stored. Programs using many such loops can run almost twice as fast as usual.

The high speed ROM option is another way that AdSpeed ST can increase performance. If the computer's ROM (read only memory) chips are replaced by faster chips, AdSpeed ST can be told to take advantage of this. They will

then be accessed at full speed, since they are not synchronized to the MMU subsystem. There is also no need to cache the ROM information when it is already being accessed at full speed, so information from RAM can stay in the cache longer and increase efficiency further. The high speed ROM option is most effective with GEM based programs and others that execute a lot of ROM code, especially if your computer has a blitter.

AdSpeed ST Configuration

AdSpeed ST has two jumpers that configure aspects of its operation. These are the pairs of posts A & B and C & D at the end of the board. To change the settings of these jumpers, move the supplied jumper plug so that it covers both posts.

A & B determine the starting speed. If they are not connected, AdSpeed ST will begin in 16 MHz high speed mode. This is the way AdSpeed ST is set when shipped. If A & B are connected, AdSpeed ST will begin in true 8 MHz mode.

A & B should be connected if you wish the computer to boot in 100% compatible 8 MHz mode. This is useful for copy protected games that don't work properly when accelerated. This does *not* permanently disable AdSpeed ST. You may switch it back to high speed mode through software.

You may optionally install a switch to the A & B jumper to control speed switching. This is described later in the Optional Speed Switch section.

The other jumper, C & D, determines whether or not AdSpeed ST will use the high speed ROM option. When open (as shipped), regular speed cached ROM is enabled. When closed, fast ROM access is enabled. See the section entitled The High Speed ROM Option for details.

520ST, 1040ST, and Mega Installation

Installation of AdSpeed ST is not complicated, but it does require removing the 68000 from the computer. This 64 pin chip is soldered to your computer's motherboard. If you have little or no soldering experience, we highly recommend that you have a knowledgeable technician perform the installation. Your local dealer should be able to handle it. ICD will do the installation for $40 plus shipping and handling.

Mega Dwners: Some Mega computers have a small daughterboard on top of the CPU. This is to correct timing problems with the Blitter. You may remove and discard this board. Circuitry that performs the same function is included in the AdSpeed ST. You will need to solder a small jumper wire to your computer to repair a trace cut as part of the installation of this small board. This jumper wire is deseribed later.

Removing the 68000

Removing the 68000 CPU chip from your computer should be done with extreme care. This is definitely not a good candidate for a first-time soldering effort.

Danger! Removing the 68000 from your computer improperly could cause serious and irreversible damage. If you have *any* doubts or misgivings, do not do this yourself. Have your local dealer or ICD perform the installation. ICD charges $40 plus shipping and handling for installation. Be sure to call first. If your computer has been damaged due to attempted installation, additional charges will be added for repairs. Since damage from improper installation can be severe, ICD may not be able to repair it. The entire risk of installation is yours.

The best way to remove the 68000 is to clip the chip from the board. This will destroy the 68000, but you will not need it again. Using a pair of side cutters or a similar tool, cut the legs from the top near the chip.

Heat each leg from the top of the board with a low wattage soldering iron until the leg is loose and pull it from the board with a pair of needle-nosed pliers. Be careful not to keep the heat applied too long, since this could cause traces or pads to lift from the circuit board.

When all the legs are removed, clear away any remaining solder from the bottom of the board with a solder removal tool.

After the 68000 has been removed, solder the supplied 64 pin socket in its place. Make sure that the notch on the socket points in the same direction that the notch on the 68000 chip did.

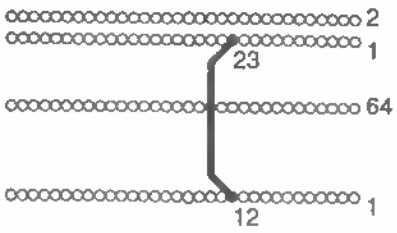

Figure 1

> **Note:** If you removed a Mega CPU daughterboard as described above, you will now need to solder a small (30 gauge is fine) jumper wire on the bottom of your computer's motherboard between pin 12 of the new CPU socket and pin 23 of the Mega expansion connector (figure 1). This is the easiest way to repair a trace that was cut when the daughterboard was installed.

Installing AdSpeed ST

Just plug AdSpeed ST into the newly installed socket. Make sure that the notch on the new 68000 points in the same direction the old one did. That's it.

The High Speed ROM Option

By replacing your TOS read only memory (ROM) chips with higher speed chips containing the same information, you can increase the performance of your computer even more.

In normal operation, the ROM areas of memory are accessed the same way as the RAM areas. Access is restricted to 8 MHz, but the cache is used to speed up execution. The ROMs are not on the MMU/DMA/Shifter system, though, so they can be accessed at full speed. Unfortunately, the ROM chips supplied with the computer are not fast enough to work at 16 MHz. You must copy the ROM information into 70 nanosecond or faster programmable ROM chips to use this option.

Once you have copied this information and replaced the ROM chips, you should change the C & D jumper as described earlier. You should not close the jumper if you have not replaced your ROM. Your computer will crash.

Replacing the ROM Chips

In 520ST, 1040ST, and Mega computers, TOS may be in either a six ROM chip set or a two ROM chip set. Theses will be in sockets. If your computer uses the two chip set, there will be four empty spaces on your computer's circuit board nearby. If your computer has the six chip set, all six of these positions will be filled with sockets and ROM chips. The ROM chips may or may not have paper labels.

The position of the ROM chips vary from model to model and version to version. They are DIP (dual in–line pin) chips.

In Mega computers, these ROM chips (and empty spaces, if applicable) should be on the left side of the board in front of the 68000 in a two by three grid. In old 520ST and some 1040ST computers, these chips are in a row on the far left side of the computer. On other 1040ST and 520STFM computers, these are in a two by three grid under the power supply. In other revisions of computers, they may be in different places. Just look for six chips in sockets or two chips in sockets with four blank spaces.

Optional Speed Switch

You may, if you wish, install a hardware switch to AdSpeed ST A & B jumper. This switch will perform two different but related functions.

The first function of the switch is to determine the starting speed. If the switch is open, AdSpeed ST will boot in 16 MHz mode. If it is closed, AdSpeed ST will boot in 8 MHz mode. You may change from the default speed with either the switch's second function or the software.

The second function of the switch is to change speed while the computer is running. If the switch is opened, the speed will change (if necessary) to 16 MHz. If the switch is closed, then the speed will change (if necessary) to 8 MHz.

Note that the position of the switch does not necessarily reflect the operating speed of AdSpeed ST, since the speed may be changed through software. For example, if the switch is in the 16 MHz position and you use 8MHZ.PRG to change the speed, you will have to move the switch to the 8 MHz position and back to the 16 MHz position to change the speed to 16 MHz.

To install this option, locate a suitable single pole single throw switch and mount it somewhere on the case. Connect the switch to the A & B post pair with 30 gauge wire using solder or a wire wrap tool. You can label the positions to help remember which is which if you wish.